THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of validating a public key in an elliptic curve cryptosystem using an elliptic curve over a finite field, the public key consisting of two coordinates (x, *y*) where x and *y* are elements of said finite field, said method comprising the steps of:
   a) receiving a public key;
   b) computing a function of the public key, the function having for each order a predefined value for points of that order; and
   c) comparing the result of the function to predetermined information to indicate the validity of the public key.
2. A method according to claim 1 further comprising the step of partially validating said public key.
3. A method according to claim 2 wherein said elliptic curve has cofactor 2, said finite field is a binary field, and said function is an algebraic expression.
4. A method according to claim 3 wherein said algebraic expression is the trace of said coordinate x and said predetermined value is 1.
5. A method according to claim 4 wherein the evaluating said trace comprises evaluating a dot product of said coordinate x with a predetermined vector.
6. A method according to claim 1 wherein said elliptic curve has cofactor 4 and said finite field is a binary field with odd exponent, said function is an algebraic expression, said predetermined information is 0 and said method further comprises:
   a) evaluating a trace of the x-coordinate,
   b) confirming that said trace is zero,
   c) confirming that said x-coordinate is not zero.
7. A method according to claim 6 wherein evaluating said trace includes evaluating a dot product of x with a predetermined vector.
8. A method according to claim 7 wherein said algebraic expression is $\mathrm{Tr}(x\mathrm{Hf}(b/x^2))$.

9. A method according to claim 8 wherein evaluating said algebraic expression comprises the steps of:

a) finding the square of the x-coordinate;

b) finding the ratio of the second coefficient of said elliptic curve with said square;

c) finding the half-trace of said ratio;

d) finding the product of said half-trace with said x-coordinate;

e) finding the trace of said product.

10. A method according to claim 9 wherein evaluating said trace of said product and said trace of said x-coordinate comprises evaluating a dot product of x with a predetermined vector.

11. A method according to claim 9 wherein evaluating said half-trace includes evaluating the matrix product of x with a predetermined matrix.

12. A method according to claim 11 wherein evaluating said trace of said product and said of said x-coordinate includes evaluating a dot product of x with a predetermined vector.

13. A method of validating a point on an elliptic curve defined over a finite field and with order an odd prime times a power of two comprising the steps of:

a) partially validating said point,

b) attempting to halve said point repeatedly until

i. no half is found, or

ii. the number of times said point is halved is the exponent of two in said power of two;

c) accepting said point if said point is partially valid and said number of times is equal to said exponent.

14. A method of validating a point on an elliptic curve with a known cofactor, comprising the steps of:

a) determining factors of said cofactor;

b) determining the possibility of scalar division of said point by each of said factors;

c) rejecting said point if any of said scalar divisions is not possible.

15. A method according to claim 14 wherein said possibility is determined by determining if a polynomial related to the division polynomial corresponding to said factor has a root.

16. A method of nearly fully validating a point on an elliptic curve with a given cofactor comprising the steps of:

a) partially validating said point;

b) finding the scalar multiple of said point to said cofactor;

c) accepting said point if said point is partially valid and said scalar multiple is the zero element of said elliptic curve.

17. A method of nearly fully validating a point on an elliptic curve with a known cofactor comprising the steps of:

a) partially validating said point;

b) confirming that said point does not equal each member of a set of predetermined points.

18. A method according to claim 17 wherein said set of predetermined points is the set of points with order dividing said cofactor.